



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

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158234
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11/30/94

REPLY TO THE ATTENTION OF:

HSRM- 6J

October 13, 1994

William T. Taylor, P.E.
Associate Principal Engineer
Energy and Environment
General Mills, Inc.
9000 Plymouth Avenue North
Minneapolis, MN 55427

RE: General Mills/Henkel Superfund Site Five-Year Review

Dear Mr. Taylor:

Enclosed is a copy of the executed five-year review for the General Mills/Henkel Superfund Site. The United States Environmental Protection Agency (U.S. EPA) has developed the five-year review in association with the Minnesota Pollution Control Agency (MPCA). Since the five-year review recommends change to the present performance standards, Dagmar Romano of the MPCA will contact you to discuss a possible meeting date in the near future. The U.S. EPA will attend the meeting and our objective is to remain the support Agency, if possible.

If you have questions or require clarification, feel free to contact me at your convenience.

Sincerely,

A handwritten signature in cursive script that reads "Thomas Alcamo".

Thomas Alcamo
Chemical Engineer

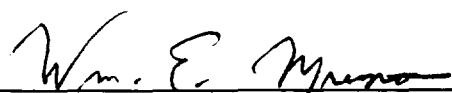
Enclosure

cc: Dagmar Romano, MPCA - w/o att.
Thomas Kenney, ORC

**FIVE-YEAR REVIEW REPORT
GENERAL MILLS/HENKEL CORPORATION
MINNEAPOLIS, MINNESOTA**

Prepared By:

**The United States Environmental Protection Agency
Region V
Chicago, Illinois**



**William E. Muno, Director
Waste Management Division**

Date 9/30/94

Five-Year Review Report General Mills/Henkel Corporation

I. Introduction

Purpose

The United States Environmental Protection Agency (U.S. EPA), in consultation with the Minnesota Pollution Control Agency (MPCA) has conducted a five-year review of the Remedial Action implemented at the General Mills/Henkel Site, Minneapolis, Minnesota. The purpose of a five-year review is to ensure that the remedial action implemented at the General Mills/Henkel Site remains protective of public health and the environment.

Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. 9601 *et seq.*, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), requires that periodic reviews be conducted for sites in which hazardous substances, pollutants, or contaminants remain at the site after initiation of remedial actions. The periodic reviews must occur at least once every five years. The five-year review requirement applies only to Record of Decisions selected after SARA and such reviews are referred to as statutory reviews. The U.S. EPA is also committed to conducting certain discretionary reviews called policy reviews which, although not required by the statute or National Contingency Plan, are conducted as a matter of policy. The General Mills/Henkel five-year review was conducted as a matter of policy.

A three tier approach has been established for conducting five-year reviews. The three types of five-year review stress an analysis of the protectiveness of the remedy. Site-specific considerations, including the nature of the response action, the status of on-site response activities, and the proximity to populated areas and sensitive environmental areas, determine the level of review for a given site. A level I review is the most basic type of evaluation of protectiveness and is appropriate for most sites. A level II review contemplates a recalculation of risk, if site-specific circumstances warrant. A level III review involves a new risk assessment and is utilized when site specific circumstances show it to be necessary. The U.S. EPA has determined that a level I review is appropriate for the General Mills/Henkel site.

Site Characteristics

The General Mills/Henkel Corporation Superfund Site is located at 2010 East Hennepin Avenue in Minneapolis, Minnesota. The 10 acre facility was a technical research facility from 1930 to 1977 conducting both food and chemical research. From 1947 through 1962, a soil absorption pit which consisted of a series of three stacked, perforated 55-gallon drums

buried 10-12 feet beneath the soil surface was used to dispose of laboratory solvents. General Mills has estimated that up to 1000 gallons of solvents were discharged into the waste pit annually from 1947 to 1962.

In June 1981, General Mills notified the Minnesota Pollution Control Agency (MPCA) that they intended to investigate the soil absorption pit. Eleven soil borings were drilled at the site and results from three borings showed elevated levels of volatile organic chemicals. The analysis showed the presence of benzene, toluene, xylene, methyl isobutyl ketone, ethylbenzene, methylene chloride, 1,1,1 trichloroethane, 1,1,2,2 tetrachlorethane, 1,1,2 trichloroethane, 1,1,2,2 tetrachloroethylene, chlorobenzene, and trichloroethylene (TCE). In 1983, three additional borings were drilled in the areas that showed significant contamination in 1981 and one boring exhibited elevated levels of VOCs.

Sixteen groundwater monitoring wells were installed in 1982, seven additional wells in 1983 and four in 1984. A wide variety of volatile organic chemicals have been present in the monitoring wells, but TCE has overshadowed all other constituents present. Two aquifers underlying the site are contaminated, the surface or glacial drift and the Platteville formation (Carimona and Magnolia Members). In addition, the St. Peter Sandstone and Prairie Du Chien Group contain elevated levels of TCE. A generalized geologic column is shown in Figure 1.

General Mills analyzed different alternatives in 1983 to address site contamination in a document called "Summary of Alternative Remedial Actions". The following is a list of the different alternatives:

1. No action.
2. Excavation of contaminated soils in the vadose zone.
3. 45-foot diameter excavation of contaminated soils to a depth of 30 feet (vadose and saturated zone).
4. 70-foot diameter excavation of contaminated soils to a depth of 30 feet (vadose and saturated zone).
5. Venting of the vadose zone in conjunction with a groundwater pumpout system.
6. Groundwater pumpout system.
7. Slurry wall and cap.
8. Soil washing in conjunction with a groundwater pumpout system.

The groundwater pumpout system was chosen since the other options would not eliminate the need for, or significantly reduce the operating time for the groundwater pumpout system. The decision to use a groundwater pumpout system was finalized on October 23, 1984 through a Consent Order between General Mills and the MPCA. The U.S. EPA did not participate in the negotiations with General Mills or the MPCA.

Groundwater Pump and Treatment System

In 1985, a total of six groundwater extraction wells were installed by General Mills to remediate the groundwater. Three of the six extraction wells are used to extract contaminated groundwater from locations downgradient from the site and within the glacial drift aquifer, with the remaining three extraction wells placed on the General Mills site. Figures 2 through 5 show the locations of the groundwater extraction and monitoring wells. The downgradient glacial drift pumpout wells are designed to contain and remove groundwater with TCE concentrations exceeding 270 parts per billion (ppb). The downgradient glacial drift groundwater is extracted at approximately 300 gallons per minute and the extracted water discharged to the Minneapolis Storm Sewer for eventual discharge to the Mississippi river through a National Pollution discharge Elimination System (NPDES) permit. The pumpout wells began operation on December 5, 1985.

Three groundwater extraction wells (#108, #109, and #110) were installed on the General Mills site and began operation on November 1, 1985. Two of the onsite extraction wells remove groundwater from the glacial drift aquifer and one onsite well removes groundwater from the Carimona member aquifer. The groundwater from the three onsite extraction wells is pumped to an onsite air stripper for treatment. The air stripper is treating approximately 150 gallons per minute with an efficiency of 99 percent. The treated groundwater is regulated by a State NPDES permit. Required effluent concentrations at the point of discharge into the Minneapolis storm sewer network are to contain less than 50 ppb of TCE based on an annual average and less than 100 ppb of TCE as a daily maximum.

In August, 1992, two additional groundwater extraction wells were installed onsite by General Mills to remediate the Magnolia member aquifer. Pursuant to the Consent Order between General Mills and the MPCA, additional groundwater extraction is required if monitoring wells in the Magnolia member aquifer showed TCE concentrations greater than 27 ppb. The groundwater extracted from the Magnolia member aquifer is discharged into the Minneapolis storm sewer network. The NPDES permit has been amended and reissued to include provisions for the new discharge into the storm sewer network from the Magnolia member aquifer extraction wells. Due to the zone of groundwater influence from the two Magnolia member aquifer pumping wells, the Carimona member (#108) pumping well has been shut down. Influent to the air stripper is now approximately 100 gallons per minute with the two Magnolia member wells pumping at approximately 200 gallons per minute.

To prevent access to the site, fencing surrounding the site has been in place prior to the investigation beginning in 1981. The former research facility now houses light industrial

businesses.

II. Discussion of Remedial Objectives

Glacial Drift Aquifer

The cleanup standard for the glacial drift aquifer is 270 ppb for TCE. The 270 ppb value was agreed upon in the 1984 Consent Order between General Mills and MPCA. Approximately 400 gallons per minute is pumped from the glacial drift aquifer. TCE near 100 ppb is present outside the groundwater capture zone.

Carimona Member of the Plattville Formation

The cleanup standard for the groundwater in the Carimona member is 27 ppb of TCE. The groundwater pump and treatment system has been recently modified by General Mills such that the extraction well on-site for the Carimona member has been replaced with two extraction wells in the deeper Magnolia member. Field observations have shown that contamination in the Carimona member is being contained by the two Magnolia extraction wells.

Magnolia Member of the Plattville Formation

The Consent Order between General Mills and the MPCA stated that if TCE concentrations exceeded 27 ppb in the Magnolia member, the groundwater pump and treatment system would require expansion to include the Magnolia member. In 1992, General Mills expanded the pumping system to include the Magnolia aquifer since TCE levels exceeded the action level of 27 ppb. Presently, the system is effective in containing the contamination and since operation, contaminate levels have decreased in the aquifer. Water is pumped at approximately 200 gallons per minute and is discharged to a storm sewer through a NPDES permit.

St. Peter Sandstone

In the Consent Order between General Mills and the MPCA, groundwater monitoring is included for the St. Peter Sandstone. A cleanup standard for the St. Peter Sandstone is not included in the Consent Order. TCE levels in groundwater are above 27 ppb within the St Peter Sandstone.

Prairie Du Chien/Jordan Aquifer

One well is located on-site which monitors the Prairie Du Chien/Jordan aquifer. The monitoring well has shown elevated levels of TCE greater than 27 ppb. Due to the depth

from ground surface and the confining layers between the St. Peter Sandstone, the contamination may be from other sources.

III. Summary of Site Visit

Site visits and subsequent meetings with General Mill, MPCA and U.S. EPA have been conducted on July 9, 1992 and September 1, 1993. Each site visit consisted of an overview of the air stripper and the groundwater extraction and monitoring wells along with a site status update. Maintenance items on the groundwater pump and treatment system that are resolved throughout the year are described in the General Mills Annual Report.

IV. Applicable or Relevant and Appropriate Requirements Review

Five-Year Review guidance established policy for U.S. EPA to review and analyze the remedial action at a site as it is affected by newly promulgated or modified Federal and State environmental laws. Applicable or Relevant and Appropriate Requirements (ARARs) associated with the construction and long-term maintenance and monitoring of the remedial action at the General Mills/Henkel Site were not addressed in the Consent Order because the October 1984 Consent Order pre-dates establishment and use of ARARs. The remedial action must meet all identified applicable or relevant and appropriate Federal and more stringent State requirements. ARARs for the site remedy are as follows:

1. Safe Drinking Water Act (SDWA), 40 CFR Parts 141-143. Establishes Maximum Contaminant Levels (MCLs) for groundwater remediation.
2. National Pollution Discharge Elimination Permit. Permit Number 0056022 - Dated August, 1992
3. Minnesota Rule 4717.7100 to 4717.7800. Health Risk Limits (HRLs) for groundwater contaminants.
4. Minnesota Rules Ch. 7050 for discharge to a surface water body.
5. Minnesota Rule 7060. Establishes uses and nondegradation goal for groundwater.
6. Minnesota Rule 4725. Water well code. Establishes standards for the construction, maintenance and sealing of wells.
7. Clean Water Act for NPDES discharge requirements.

8. Clean Air Act for air stripper requirements.

To-Be-Considered (TBC) Criteria

1. Minnesota Department of Health (MDH) Recommended Allowable Limits (RALs), Release 3. Establishes contaminant specific performance standards for groundwater remediation.

The remedial action performance standards for groundwater are 270 ppb of TCE in the glacial drift aquifer and 27 ppb for the Carimona member and Magnolia member. Table 1 identifies the MCLs, HRLs, RALs and cleanup goals for the TCE in groundwater for the General Mills site and Table 2 through 6 presents groundwater monitoring data.

The NPDES permit for the treated and untreated groundwater was modified in 1992 and monitoring has shown compliance with the discharge requirements.

V. Recommendations

The cleanup levels for TCE established in the Consent Order (referenced above) shall be met before the Consent Order is to be terminated. Once this occurs actions should be taken by MPCA or U.S. EPA to enforce the more protective groundwater cleanup standard of 5 ppb for TCE, or whatever is the current standard (MCL or HRL or whatever is lowest) at that time.

The St. Peter Sandstone which is not a part of the Consent Order between General Mills and MPCA appears to have contamination at levels greater than 5 ppb of TCE. The effect of the Magnolia pumping wells on the St. Peter should be investigated and if the zone of capture does not affect the St. Peter, then expansion of the pumping system to contain and treat the St. Peter groundwater should be investigated along with any off-site sources. A revision to the NPDES permit may be required if the groundwater capture system is expanded.

U.S. EPA does not believe that the groundwater standard established in the Consent Order is protective of human health and the environment and recommends that MPCA and General Mills amend the Consent Order to establish 5 ppb as the cleanup standard for TCE.

The groundwater is monitored twice a year, with one sampling event for TCE only. Since TCE is by far the most prevalent compound, the monitoring plan is adequate with one exception. Vinyl chloride should be added to the volatile organic chemical parameter list since vinyl chloride is a common degradation product of TCE.

VI. Statement of Protectiveness

The groundwater pump and treatment system remains functional, but requires the above mentioned modifications. When the modifications are implemented, the remedy should provide adequate protection to public health and the environment.

VI. Next Review

It is probable that the cleanup standards will not be reached by the next five-year review in September 1999. This five-year review will be a Level I review, consisting of review of all recent groundwater monitoring data and newly promulgated environmental laws.

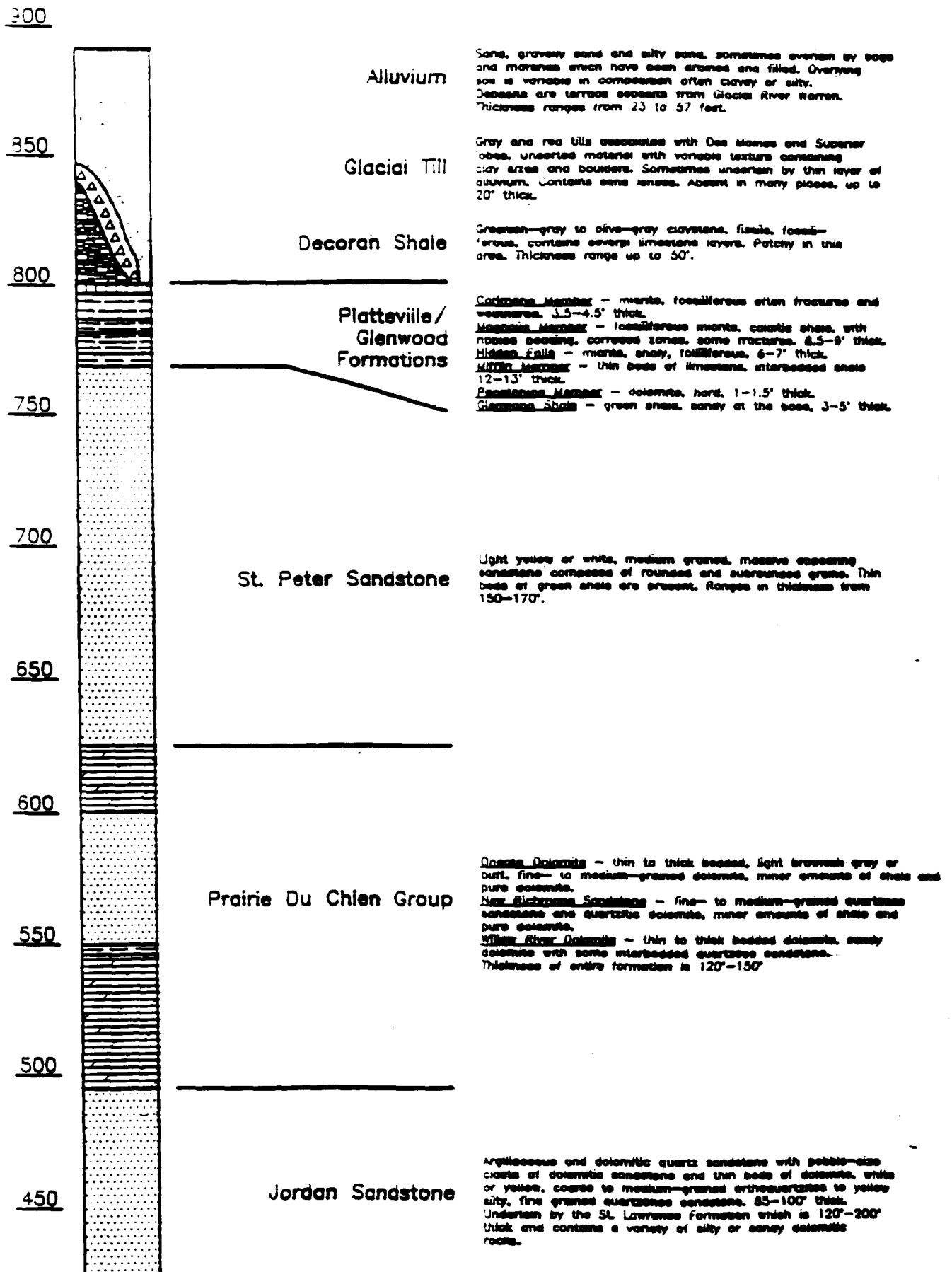
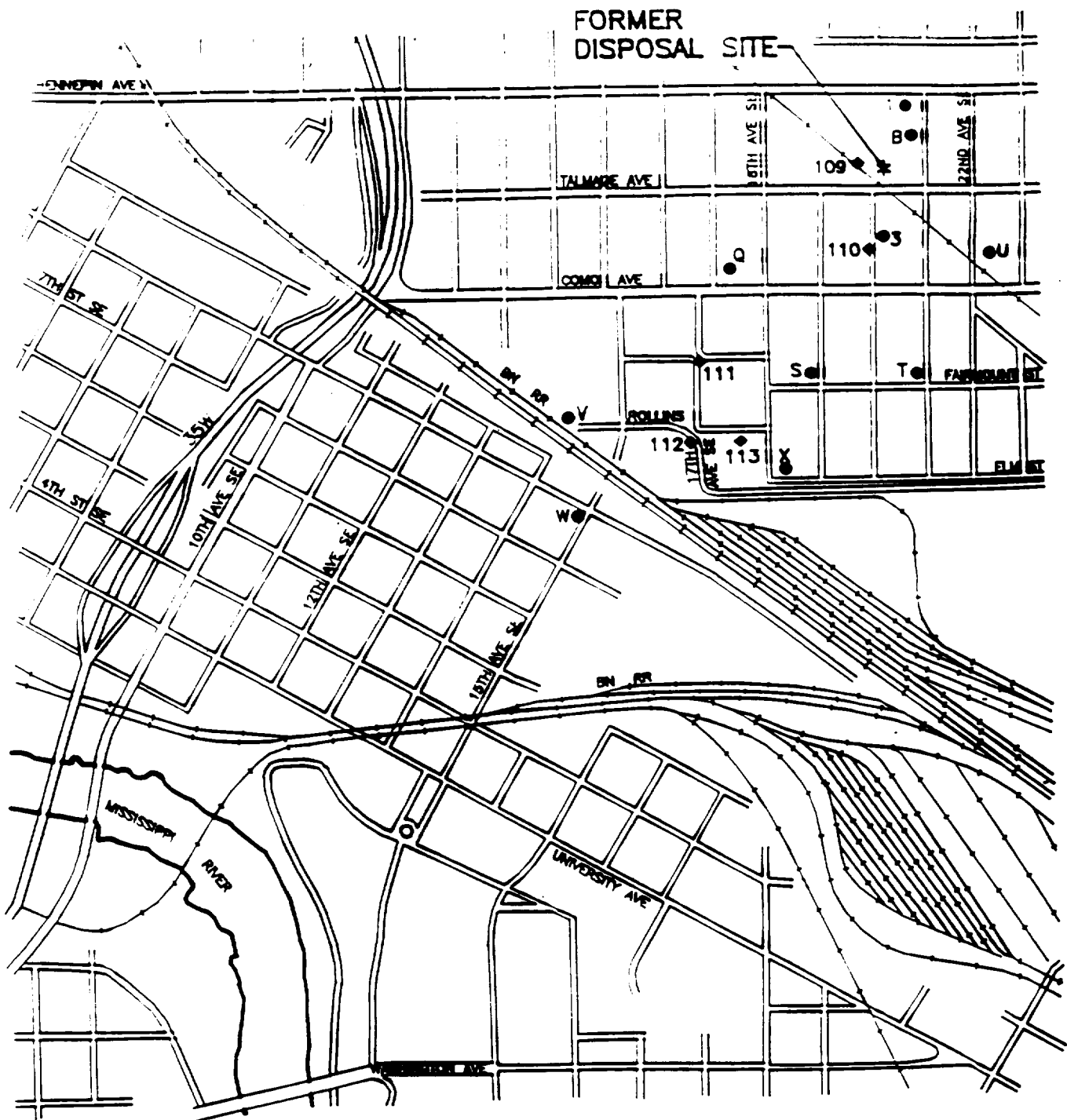


Figure 1
GENERALIZED GEOLOGIC COLUMN

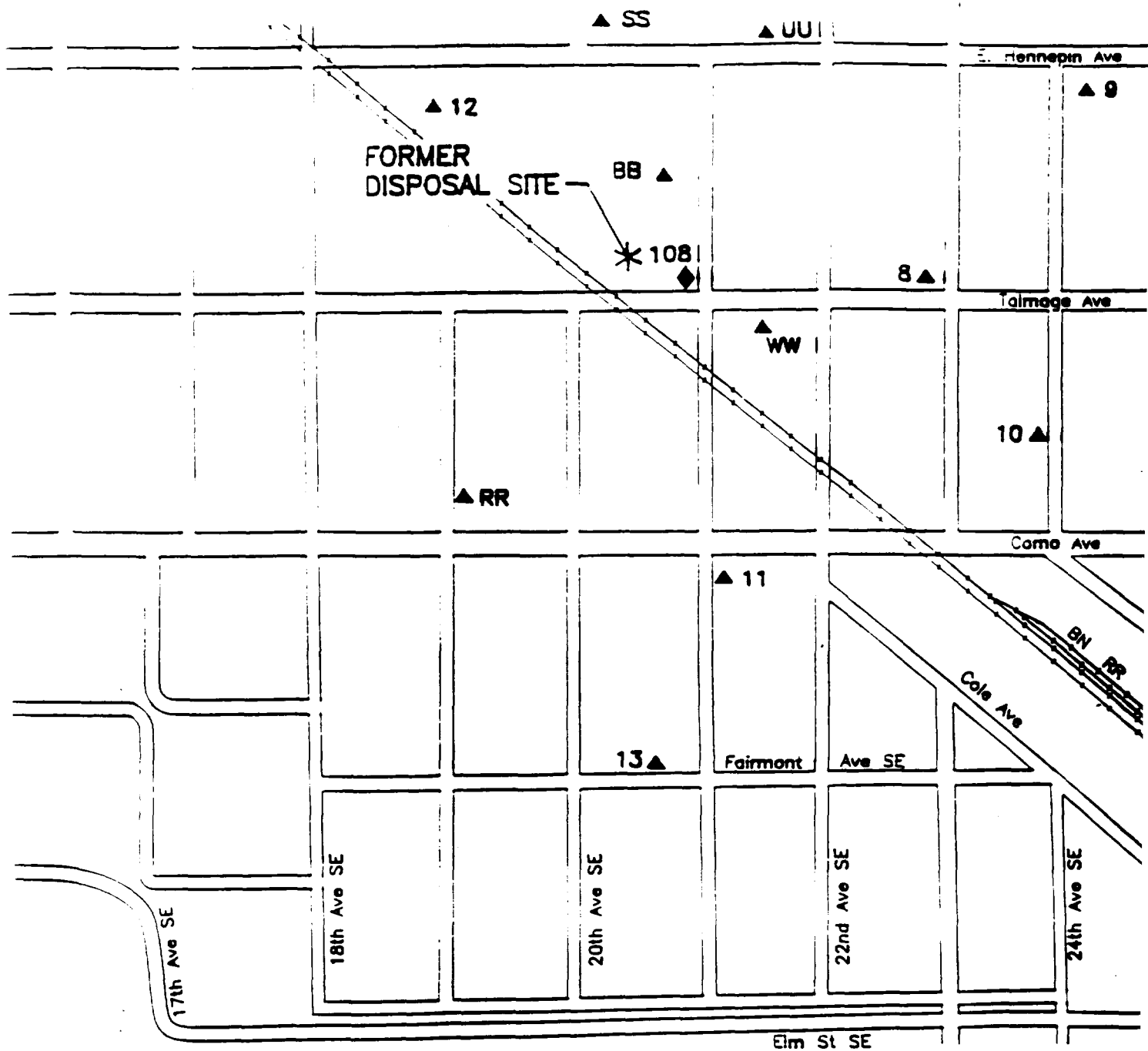


- GLACIAL DRIFT MONITORING WELL
- ◆ GLACIAL DRIFT PUMP-OUT WELL



0 1000
SCALE IN FEET

Figure - 2-
GLACIAL DRIFT AQUIFER
1992 MONITORING LOCATIONS



- ▲ CARIMONA MEMBER MONITORING WELL
- ◆ CARIMONA MEMBER PUMP-OUT WELL

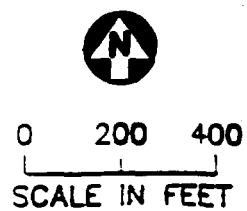
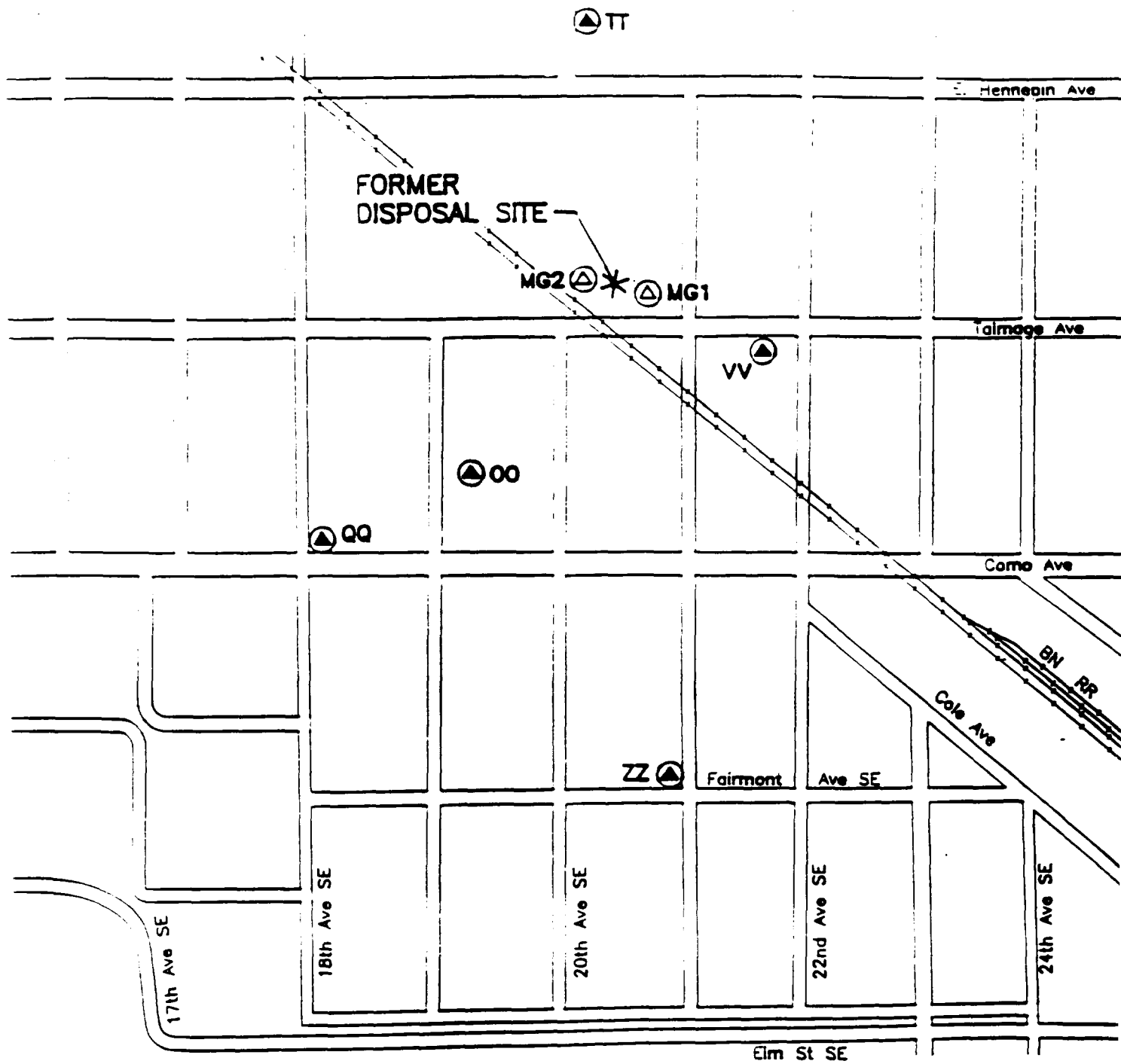


Figure 3
CARIMONA MEMBER
1992 MONITORING LOCATIONS

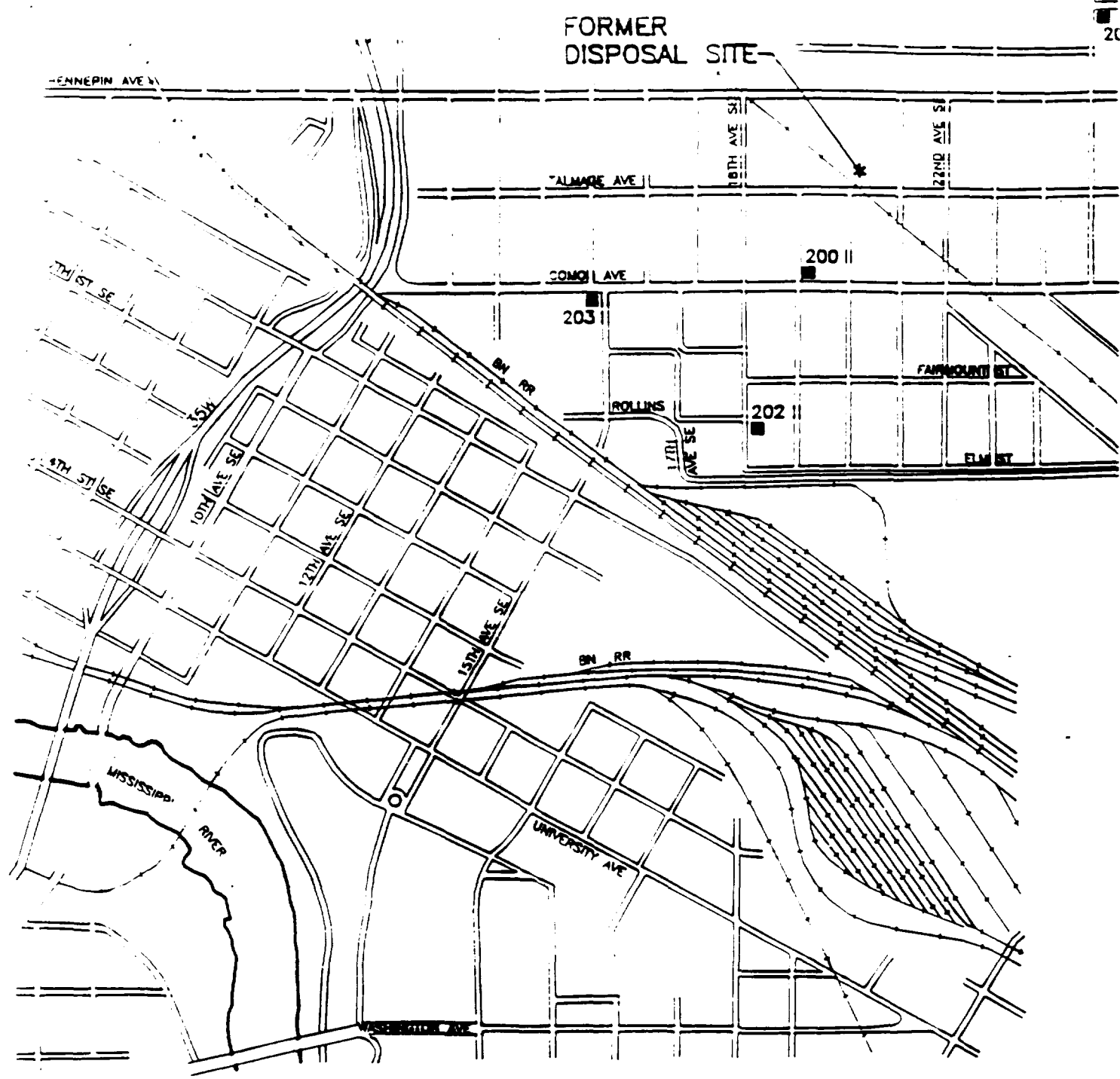


- ⊙ MAGNOLIA MEMBER MONITORING WELL
- ⊙ MAGNOLIA MEMBER PUMP-OUT WELL



0 200 400
SCALE IN FEET

Figure 4
MAGNOLIA MEMBER
1992 MONITORING LOCATIONS



■ ST. PETER SANDSTONE MONITORING WELL



0 1000
SCALE IN FEET

Figure 5
ST. PETER SANDSTONE
1992 MONITORING LOCATIONS

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TABLE 1
Groundwater Cleanup Standards

<u>Chemical Parameter</u>	<u>MCL</u>	<u>HRL</u>	<u>RAL</u>
Trichloroethylene	5 ug/l	None	30 ug/l

Groundwater Cleanup Goal For TCE

Glacial Drift Aquifer - 270 ug/l

Carimona Member - 27 ug/l

Magnolia Member - 27 ug/l

St. Peter Sandstone - None

Prairie Du Chien/Jordan - None

TABLE 2
1993 WATER QUALITY DATA
GLACIAL DRIFT WELLS

(concentrations in ug/L)

	9	2	5		7	10	17
	05/18/93	05/18/93	05/18/93	11/23/93	05/18/93	05/18/93	05/18/93 11/22/93
1,1-Dichloroethane	1.4	<0.50	<0.50	--	<0.50	<0.50	<0.50 --
1,2-Dichloroethylene, cis	5.1	<0.50	11	--	<0.50	<0.50	4.8 --
1,2-Dichloroethylene, trans	<0.50	<0.50	1.5	--	<0.50	<0.50	<0.50 --
1,2-Dichloroethane	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50 --
1,1,1,2-Tetrachloroethane	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50 --
Tetrachloroethylene	5.2	<0.50	2.1	--	<0.50	<0.50	<0.50 --
1,1,1-Trichloroethane	1.7	1.0	<0.50	--	<0.50	<0.50	<0.50 --
Trichloroethylene	580	<0.50	390	400	<0.50	3.7	68 100
Sum Volatile Organics	590	1.0	400	400	ND	3.7	73 100
	4		X	1		3	
	05/19/93	11/22/93	05/18/93	05/18/93	11/22/93	05/18/93	11/22/93
1,1-Dichloroethane	<0.50	--	<0.50	<0.50	--	3.8	--
1,2-Dichloroethylene, cis	0.8	--	<0.50	<0.50	--	33	--
1,2-Dichloroethylene, trans	<0.50	--	<0.50	<0.50	--	<0.50	--
1,2-Dichloroethane	<0.50	--	<0.50	<0.50	--	<0.50	--
1,1,1,2-Tetrachloroethane	<0.50	--	<0.50	<0.50	--	<0.50	--
Tetrachloroethylene	<0.50	--	<0.50	1.0	--	3.7	--
1,1,1-Trichloroethane	<0.50	--	<0.50	<0.50	--	1.5	--
Trichloroethylene	2.9	2.9	<0.50	<0.50	<0.50	470	740
Sum Volatile Organics	3.7	2.9	ND	1.0	ND	510	740

-- Not analyzed.
ND Not detected.

3,005
01/19/94

TABLE 3

1993 WATER QUALITY DATA
CARIMONA MEMBER WELLS

(concentrations in ug/L)

	BB	RR	SS	UU	WW	8
	05/19/93	05/19/93	05/18/93	05/18/93	05/18/93	05/19/93
1,1-Dichloroethane	5.4	1.3	3.2	<0.50	<0.50	0.6
1,2-Dichloroethylene, cis	95	39	1.2	3.1	27	2.3
1,2-Dichloroethylene, trans	1.1	<0.50	<0.50	<0.50	1.4	<0.50
1,2-Dichloroethane	<0.50	<0.50	<0.50	<0.50	<0.50	0.8
1,1,2,2-Tetrachloroethane	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	12	<0.50	<0.50	<0.50	<0.50	0.6
1,1,1-Trichloroethane	3.3	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	940	93	2.5	29	130	92
Sum Volatile Organics	1100	130	6.9	32	160	96

	9		10		11	
	05/19/93	11/23/93	05/19/93	11/23/93	05/18/93	11/23/93
1,1-Dichloroethane	0.5	--	<0.50	--	<0.50	--
1,2-Dichloroethylene, cis	<0.50	--	<0.50	--	4.8	--
1,2-Dichloroethylene, trans	<0.50	--	<0.50	--	<0.50	--
1,2-Dichloroethane	0.6	--	<0.50	--	<0.50	--
1,1,2,2-Tetrachloroethane	<0.50	--	<0.50	--	<0.50	--
Tetrachloroethylene	<0.50	--	<0.50	--	<0.50	--
1,1,1-Trichloroethane	<0.50	--	<0.50	--	<0.50	--
Trichloroethylene	1.9	0.78	46	43	120	180
Sum Volatile Organics	3.0	0.78	46	43	120	180

	12		13	108	
	05/19/93	11/23/93	05/18/93	06/08/93	11/23/93
1,1-Dichloroethane	<0.50	--	<0.50	3.2	--
1,2-Dichloroethylene, cis	<0.50	--	1.1	88	--
1,2-Dichloroethylene, trans	<0.50	--	<0.50	2.2	--
1,2-Dichloroethane	<0.50	--	<0.50	<0.50	--
1,1,2,2-Tetrachloroethane	<0.50	--	<0.50	<0.50	--
Tetrachloroethylene	<0.50	--	<0.50	2.9	--
1,1,1-Trichloroethane	<0.50	--	<0.50	0.87	--
Trichloroethylene	<0.50	<0.50	26	640	300
Sum Volatile Organics	ND	ND	27	740	300

-- Not analyzed.

ND Not detected.

3.006

12/21/93

TABLE 4

1993 WATER QUALITY DATA
MAGNOLIA MEMBER WELLS

(concentrations in ug/L)

	00		00		00	
	05/19/93	11/23/93	05/19/93	05/18/93	11/22/93	
1,1-Dichloroethane	<0.50	--	<0.50	<0.50	--	
1,2-Dichloroethylene, cis	<0.50	--	1.4	1.2	--	
1,2-Dichloroethylene, trans	<0.50	--	<0.50	<0.50	--	
1,2-Dichloroethane	<0.50	--	<0.50	<0.50	--	
1,1,2,2-Tetrachloroethane	<0.50	--	<0.50	<0.50	--	
Tetrachloroethylene	<0.50	--	<0.50	<0.50	--	
1,1,1-Trichloroethane	<0.50	--	<0.50	<0.50	--	
Trichloroethylene	11	5.7	13	0.7	1.8	
Sum Volatile Organics	11	5.7	16	1.9	1.8	

	VV		ZZ	
	05/18/93	11/22/93	05/19/93	11/23/93
1,1-Dichloroethane	1.1	--	<0.50	--
1,2-Dichloroethylene, cis	39	--	1.7	--
1,2-Dichloroethylene, trans	<0.50	--	<0.50	--
1,2-Dichloroethane	<0.50	--	<0.50	--
1,1,2,2-Tetrachloroethane	<0.50	--	<0.50	--
Tetrachloroethylene	1.4	--	<0.50	--
1,1,1-Trichloroethane	<0.50	--	<0.50	--
Trichloroethylene	190	150	73	70
Sum Volatile Organics	230	150	75	70

-- Not analyzed.

3.007
12/21/93

TABLE 5

1993 WATER QUALITY DATA
ST. PETER SANDSTONE WELLS

(concentrations in ug/L)

	200		201		202	203
	-----		-----		-----	-----
	05/19/93	11/23/93	05/19/93	05/19/93	05/19/93	05/19/93
1,1-Dichloroethane	<0.50	--	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethylene, cis	11	--	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethylene, trans	<0.50	--	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	<0.50	--	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	<0.50	--	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	<0.50	--	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	<0.50	--	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	89	19	<0.50	<0.50	1.4	
Sum Volatile Organics	100	19	ND	ND	1.4	

ND Not detected.

-- Not analyzed.

1.008

12/21/93

TABLE 6

1993 WATER QUALITY DATA
PRAIRIE DU CHIEN/JORDAN WELL

(concentrations in ug/L)

REMARKS		
	05/19/93	12/23/93
1,1-Dichloroethane	0.52	1.0
1,2-Dichloroethylene, cis	<0.50	<0.50
1,2-Dichloroethylene, trans	<0.50	<0.50
1,2-Dichloroethane	<0.50	<0.50
1,1,2,2-Tetrachloroethane	<0.50	<0.50
Tetrachloroethylene	<0.50	<0.50
1,1,1-Trichloroethane	<0.50	<0.50
Trichloroethylene	16	36
Sum Volatile Organics	17	37

11.009
12/21/93